IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of

Wayne F. PIERZGA et al.)	
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Divisional Patent Application of)	Prior Group: 2663
Serial No.: 08/860,243)	
)	Examiner: TBA
Filed: November 28, 2001)	
)	Atty Dkt: 02918.00010
For: MULTIPLEX)	
COMMUNICATION)	

PRELIMINARY AMENDMENT

Director of Patents
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend the above-captioned application as set forth below.

IN THE CLAIMS:

Please cancel claims 1-94 without prejudice or disclaimer of the subject matter contained therein.

Please add the following claims:

--95.   An OFDM transmitter, comprising:

an OFDM generator generating an ensemble of orthogonal, information-carrying frequency subcarriers; and

a transmit filter passing the subcarriers and at least a portion of first sidelobes of a highest and a lowest frequency subcarrier, the transmit filter attenuating a second and subsequent sidelobes of the highest and lowest frequency subcarriers.

96.   A transmitter according to claim 95, wherein the transmit filter has regular nulls that lie within the sidelobes, away from the nulls between the sidelobes.

97.   A transmitter according to claim 95, further comprising a control circuit controlling a number of the subcarriers, and controlling a bandwidth of the transmit filter to match the number of the subcarriers.

98.   A transmitter according to claim 95, wherein a transition frequency of the transmit filter passes through first outer sidelobes of the highest and lowest frequency subcarriers.

99.   A method of receiving an OFDM signal, the method comprising steps of:
        filtering the OFDM signal to pass all the OFDM subcarriers and at least a portion of first outer sidelobes of a highest and a lowest frequency information-carrying subcarriers; and
        attenuating frequencies outside a frequency of second outer sidelobes of the highest and lowest frequency subcarriers.

100.   A method of filtering an orthogonal frequency division multiplexed signal comprising .a plurality of orthogonal, information-carrying subcarriers each having a (sin x/x) spectral form, the method consisting of steps of:
        filtering the plurality of subcarriers to pass all the subcarriers and at least a portion of first sidelobe of a highest and a lowest subcarrier; and
        attenuating second and further sidelobes of the highest and lowest frequency subcarriers.

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101.   A method according to claim 100, wherein a filtering transition frequency passes through first outer sidelobes of the highest and lowest frequency subcarriers.

102.   A method according to claim 100, wherein the step of filtering applies nulls within each of second and further sidelobes, away from the nulls therebetween.

103.   A receiver for receiving an OFDM signal having subcarriers, comprising: a filter having a pass band arranged to pass the subcarriers of the OFDM signal and at least a portion of first outer sidelobes of the highest and lowest subcarriers present therein and to attenuate frequencies corresponding to spectral positions where the second and further outer sidelobes of the highest and lowest frequency subcarriers would be.

104.   A receiver according to claim 103, further comprising a control circuit setting a bandwidth of the filter between at least first and second different values corresponding to at least first and second respective different numbers of subcarriers.

105.   A receiver according to claim 103, wherein a transition frequency of the filter passes through first outer sidelobes of the highest and lowest frequency subcarriers.

106.   A receiver according to claim 103, wherein the filter has regular nulls that lie within the sidelobes, away from the nulls between the sidelobes.

107.   An OFDM signal comprising a plurality of orthogonal information-bearing subcarriers, first outer sidelobes of a highest and a lowest frequency of the subcarriers being partially attenuated by filtering.

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108.   A method of processing an orthogonal frequency multiplexed signal modulated in symbol periods, the method comprising steps of:

a first step of reducing a magnitude of the orthogonal frequency multiplexed signal over a symbol period to maintain orthogonality, and

where necessary, a second step of reducing a magnitude of particular temporal portions of the orthogonal frequency multiplexed signal relative to others to reduce a peak-to-mean ratio of the orthogonal frequency multiplexed signal.

109.   A method according to claim 108, wherein the first step comprises steps of:

testing the signal magnitude against a first predetermined threshold; and

in the event that any temporal portion of a symbol period exceeds the first threshold, reducing all temporal portions of the symbol period by a same factor.

110.   A method according to claim 108, wherein the factor is constrained not to exceed a second predetermined threshold and, in the event that the second predetermined threshold is not exceeded, the factor reduces magnitudes of all temporal portions beneath the first predetermined threshold.

111.   A method according to claim 110, wherein the second step comprises steps of:

comparing temporal portions of a symbol period with a third predetermined threshold subsequent to processing by the first step; and

in the event that any of said temporal portions exceeds said third predetermined threshold, reducing the temporal portion magnitudes to not exceed the third predetermined threshold while leaving unmodified other temporal portion-magnitudes that do not exceed the third predetermined threshold.

112.   A method according to claim 111, wherein the third predetermined threshold is greater than the first predetermined threshold.

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113.   An OFDM transmitter, comprising:

a symbol power attenuator circuit operable to evenly attenuate all successive samples of an OFDM symbol of excessive magnitude or peak to average ratio; and

a sample attenuator circuit operable to selectively attenuate relatively high magnitude samples within a symbol period.

114.   A receiver for a frequency multiplexed signal comprising a plurality of frequency subcarriers carrying information in symbol periods and having intervals of predetermined amplitude between the symbol periods, the receiver comprising a signal timing circuit arranged to generate a timing signal permitting recovery of the information, the signal timing circuit being responsive to the intervals, the recovery being carried out on the multiplexed signal independently of the recovery of the subcarriers.

115.   A receiver according to claim 114, wherein the signal timing circuit comprises an averaging circuit arranged to generate a signal responsive to a long term average value of the received frequency multiplexed signal at a point in time within a symbol period and previous signal values at corresponding points in time within previous symbol periods.

116.   A receiver according to claim 115, wherein the averaging circuit comprises a leaky integrator.

117.   A receiver according to claim 115, further comprising a high pass circuit receiving an output of the averaging circuit and generating an output signal responsive to transitions in the output of the averaging circuit.

118.   A receiver according to claim 115, wherein the high pass circuit comprises a differencer.

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119.   A method of acquiring the timing within a frequency multiplexed signal which comprises a plurality of subcarriers each modulated synchronously with information in symbol periods separated by intervals of a predetermined magnitude, the method comprising a step of detecting the intervals prior to separation or demultiplexing the frequency multiplexed signal.

120.   A method according to claim 119, further comprising a step of performing long term averaging of each signal value at a point in a symbol period and corresponding signal values at corresponding points in previous symbol periods.

121.   A method according to claim 120, further comprising a step of differencing the averaged signal to detect transitions therein.

122.   A frequency acquisition circuit for acquiring the frequency of a signal modulated in a succession of symbol periods, and including first and second symbol periods, the frequency acquisition circuit comprising:

a sampling circuit sampling over a fraction of each the symbol period;

a first frequency phasor circuit arranged to generate, responsive to the samples an output signal indicative of a phase advance due to frequency offset between the first and second symbol periods over a first interval that is not an integral number of the symbol periods; and

a second frequency phasor circuit arranged to generate, responsive to the samples, an output signal indicative of the phase advance due to frequency offset over a second interval that is not equal to the first interval.

123.   A circuit according to claim 122, wherein the first and second intervals differ by no more than one symbol period.

124.   A circuit according to claim 122, wherein the first and second intervals differ by no more than the fraction of a symbol period.

125.   A circuit according to claim 122, wherein the fraction is approximately half of a symbol period.

126.   A circuit according to claim 122, further comprising a third frequency phasor circuit responsive to the samples to generate an output signal indicative of the phase advance over a third interval.

127.   A circuit according to claim 126, wherein the second interval comprises an integral number of symbol periods and the first and third intervals comprise, respectively, a fraction of a symbol period more and a fraction of a symbol period less than the second interval.

128.   A circuit according to claim 122, wherein each frequency phasor circuit comprises a delay-multiply-average circuit.

129.   A circuit according to claim 122, wherein the first and second symbol periods each include reference symbol data representing reference symbols of predetermined phase values, and the sampling circuit is timed to sample only the reference symbol data symbol periods.

130.   A method of frequency acquisition for a signal modulated in symbol periods; comprising steps of:

sampling symbol periods over fractions of their lengths to pass frequencies higher than a reciprocal of the symbol period;

estimating a phase advance due to frequency offset over a first number of the samples and the phase advance due to frequency offset over a second number of the samples, the

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first and the second numbers corresponding to time periods that differ by an amount that is not an integer number of the symbol periods; and

forming a measure of a difference between the first and second phase advances to provide a frequency error estimate.

131.   A method according to claim 130, wherein some of the symbol periods contain signals representing reference symbols recurring at regular intervals, and wherein the frequency error estimate is unambiguous over a frequency range greater than the reciprocal of the interval between reference symbols.

132.   A method of decoding a convolutionally-encoded and interleaved signal comprising steps of:

sampling the signal;

reading each signal sample into a deinterleaver circuit in a first order;

reading each sample into a control circuit arranged to generate one or more control signals responsive to a level of each sample;

reading the samples out of the deinterleaver in a second order;

quantizing the samples; and

decoding the quantized samples;

characterized by a step of reading the samples into the control circuit in parallel with the reading thereof into the deinterleaver circuit, and

by a step of aligning the range of a quantizer with that of the samples prior to reading the samples out of the deinterleaver circuit.

133.   A decoder circuit for an interleaved and convolutionally-encoded signal, comprising:

a deinterleaver arranged to receive successive samples of a received signal;

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a quantizer arranged to receive samples read out from the deinterleaver circuit; and

a decoder arranged to decode the quantized samples;

characterized by a range control circuit operably connected to receive the samples in parallel with the deinterleaver circuit and to derive control signals aligning a range of the quantizer and that of the samples read into the deinterleaver circuit, prior to read out of the samples from the deinterleaver circuit.

134.   A satellite broadcasting system comprising:

a ground based broadcasting system transmitting an orthogonal frequency multiplexed signal; and

at least one repeater satellite in non-geostationary orbit.

135.   A system according to claim 134, wherein each repeater satellite is arranged to generate a plurality of spot beams.

136.   A system according to claim 134, further comprising handover control means for transferring a receiver between two of the beams or two of the satellites.

137.   A system according to claim 136, wherein a rate of transmission of data on the frequency multiplexed signal is increased prior to the handover.

138.   A system according to claim 137 in which a number of subcarriers in the multiplexed signal is increased to increase the rate of transmission.

139.   A ground station for a system according to claim 134.

140.   A satellite for a system according to claim 134.

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141.   A receiver for a system according to claim 134.

142.   A receiver according to claim 141, comprising first and second acquisition circuits for acquiring signals from different satellites.--
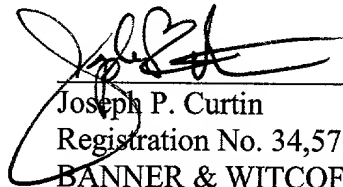

CONCLUSION

Applicants respectfully submit that new claims 95-142 are respectively based on originally-filed and subsequently-withdrawn claims 47-94 in parent application 08/860,243, filed September 25, 1997.

Applicants look forward to prosecution on the merits. Should the Examiner find that a telephonic or personal interview would expedite passage to issue of the present application, the Examiner is encouraged to contact the undersigned attorney at the telephone number indicated below.

It is requested that this application be passed to issue with claims 95-142.

Respectfully submitted,

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